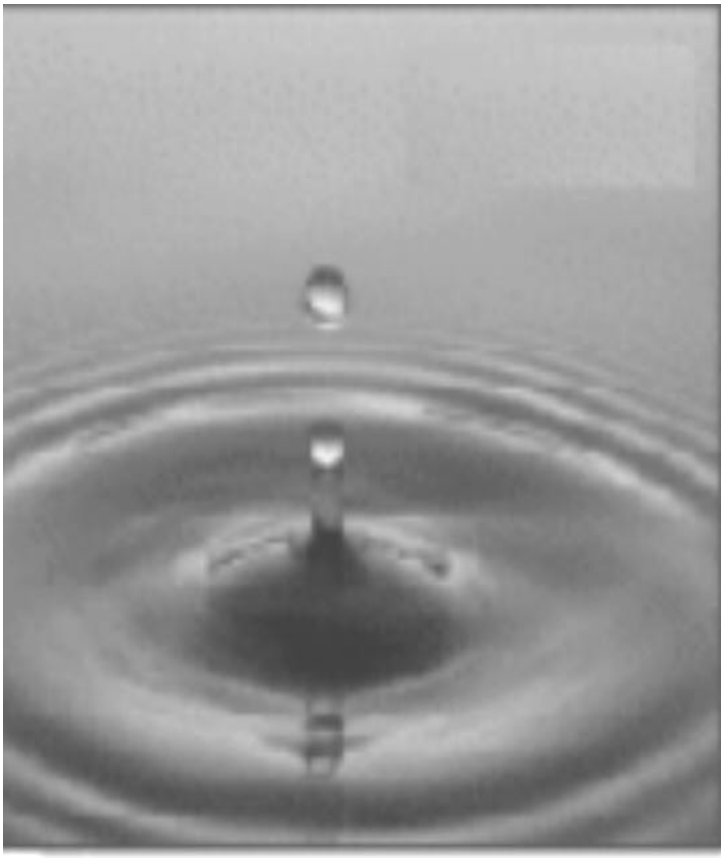
BUREAU OF WATER

South Carolina Department of Health and Environmental Control

South Carolina Groundwater Contamination Inventory



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South Carolina Department of Health and Environmental Control

2003 South Carolina
Groundwater Contamination Inventory

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Acknowledgment

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BACKGROUND

The first inventory to quantify the status of groundwater quality in South Carolina with respect to impact by man's activities was undertaken by the Department of Health and Environmental Control in 1980. The report inventoried thirty-seven (37) cases of groundwater contamination under study and a total of sixty (60) documented releases.

The principal activities shown to be impacting groundwater in the 1980 report were wastewater pits, ponds, and lagoons (17%), wastepiles and stockpiles (17%), spills (17%), and storage tanks (10%). The principal contaminants identified included metals (22%), organics (21%), petroleum products (22%), and nutrients (16%).

The 1982 inventory documented a total of 84 groundwater contamination cases. The 30 percent increase in groundwater contamination incidents primarily represented an increase in the level of knowledge derived from an increase in monitoring at these sites, rather than a significant increase in environmental impacts. Among the activities identified, land disposal of sludges and effluents appeared for the first time as one of the major contributors to groundwater impact. Prior to the early 1980's, there was only limited monitoring of groundwater at such treatment/disposal sites.

In February of 1983, the Department prepared a "Report to the General Assembly on Groundwater Contamination in South Carolina". The report contained an updated list of 154 documented cases of groundwater contamination. The activities identified as most often impacting groundwater included storage tanks and transmission lines (18%), wastewater pits, ponds, and lagoons (19%), and landfills (16%). The principal contaminants identified included metals (29%), petroleum products (24%), and organics (22%).

From 1980 to 2003, there was a steady increase in known groundwater contamination sites as depicted in Figure 1. The overall increase in cases from 60 in 1980 to 4186 in this report is attributable to: 1) an increase in the facility monitoring efforts; 2) a more focused awareness of the unique nature and value of the state's groundwater resources; and 3) the enactment of the Underground Storage Tank (UST) Control Regulation (R.61-92). The sharp increase in the number of sites listed from 1986 to 1992 is primarily due to increased monitoring at underground storage tank facilities. The enactment of the State Underground Petroleum Emergency Response Bank Act (SUPERB) in June 1988 has also contributed greatly to this rise, as SUPERB contains incentives to promptly report releases from USTs.

2003 INVENTORY

The Department prepares and maintains an inventory of known groundwater contamination cases in the state. The United States Environmental Protection Agency 106 Grant, authorized by Section 106 of the Clean Water Act, funds this effort.

The criteria used to determine whether a site is listed in the inventory are the drinking water quality standards outlined in the State Primary Drinking Water Regulations (R.61-58) and the S.C. Water Classifications and Standards (R.61-68). Per R.61-68, Class GB designation is given to groundwater that meets the definition of an underground source of drinking water (USDW). The standards for Class GB groundwater are the maximum contaminant levels (MCLs) set forth in the State Primary Drinking Water Regulations. These regulations include MCLs for selected inorganic and organic chemicals, as well as naturally occurring radionuclides. Compounds for which standards or proposed MCLs do no exist are evaluated on an individual

basis. The evaluation includes obtaining information from both literature searches and communication with qualified professionals in the fields of toxicology and chemistry. Groundwater contaminant plumes are listed as discharging to a surface water body if plume contaminants are detected at any level in the surface water.

Soil impacts from potential contaminants of concern are not listed in this inventory. All sites where recent groundwater analytical data indicate that Class GB standards have been exceeded are included in the 2003 inventory. Inclusion on the inventory does not mean that the affected groundwater is currently utilized, or will be utilized in the future, as a source of drinking water. Nor does it indicate that the contamination poses an unacceptable risk to human health or the environment, as determined by the Department. It should be noted that several cases, which appeared on the 2002 list, have been deleted. Most of these cases were UST sites and were removed from the inventory based on a change in their Risk-Based Corrective Action Classification. An explanation of the Risk-Based Corrective Action priority classification system for releases from regulated underground storage tanks is provided in Appendix A. Appendix B provides a listing by county of the 4186 documented cases of groundwater contamination in South Carolina identified through August 15, 2003.

RESULTS

The major sources of groundwater contamination are presented in Figure 2. Major sources are divided into eleven general categories as follows:

Underground Storage Tanks (UST) - in this report, both UST's regulated by state and federal regulations and non-regulated tanks (i.e. - heating fuel USTs).

Spills and Leaks (S/L) - the results of small releases (e.g., spillage around disposal containers, leaks through cracked concrete sumps) that are not attributed to a single event.

Pits, Ponds, and Lagoons (PPL) - surface impoundments generally associated with the permitted storage, treatment, and disposal of industrial and municipal wastewaters.

Unknown (UNK) - source(s) of contamination in these cases has not been determined.

Aboveground Storage Tank (AGT) - tank-based containment systems for liquids where greater than ninety percent of the volume of the system is above the ground surface.

Landfills (LF) - sites involved with the disposal by burial of "inert" domestic, commercial, and industrial solid wastes (termed "sanitary" landfills) or toxic wastes (hazardous waste landfills). Disposal typically consists of a system by which waste and soil are placed in alternating layers.

Unpermitted Disposal (UPD) - practices/activities that are related to the unauthorized disposal of contaminants.

Other (OTHER) - sources of contamination that do not fit into the previously described categories.

Septic Tank/Tile Field (STTF) - a subsurface domestic or industrial sewage disposal system that utilizes a concrete tank and connected leach beds designed to encourage bacterial activity to decompose the waste.

Single-Event Spill (SPL) - one-time or large-volume spills of contaminants (i.e., spills from trains or tank-truck accidents, pipeline ruptures, etc.).

Spray Irrigation (SI) - sites where municipal or industrial wastewater effluent and sludges are sprayed upon the land surface at rates designed and permitted to avoid overland flow of the effluent.

Of the source types listed above, UST releases account for 3518 instances of groundwater contamination. Spills and leaks are the second largest source of contamination with 195 occurrences. Leaking pits, ponds, and lagoons are identified as the third major source with 150 sites. Unknown sources account for approximately 124 cases. Aboveground Storage Tanks are the source of contamination at 119 sites. A summary of these and other activities impacting groundwater and their occurrence is presented in Table 1.

Table 1. Contamination Sources Impacting Groundwater

CONTAMINATION SOURCE	ABBREVIATION	# OF SITES
Underground Storage Tank	UST	3518
Spills and Leaks	S/L	195
Pits, Ponds, & Lagoons	PPL	150
Unknown	UNK	124
Aboveground Storage Tank	AGT	119
Landfill	LF	109
Unpermitted Disposal	UPD	53
Other	OTHER	35
Septic Tank/Tile Field	STTF	18
Single-Event Spill	SPL	15
Spray Irrigation	SI	13

The contaminant categories associated with groundwater impacts are presented in Figure 3. Due to the wide variety and number of specific chemicals that may impact groundwater, general categories were established for discussion purposes. These categories are:

Petroleum Products (PETRO) - such as gasoline, kerosene, JP-4, diesel fuel, heating oils, and their dissolved constituents.

Volatile Organic Compounds (VOC) - synthetic volatile organic compounds, excluding dissolved constituents of petroleum products and their additives.

Metals (METALS) - arsenic, barium, cadmium, chromium, fluoride, lead, mercury, selenium, and silver.

Nitrates (NO_3) - nitrate, or nitrogenous compounds such as ammonia, ammonium, nitrite, etc. which have a potential to convert to nitrate.

Radionuclides (RAD) - man-made radioactive elements in excess of Primary Drinking Water Regulations maximum contaminant levels (MCLs).

Base, Neutral, and Acid Extractables (BNA) - any of a large select group of organic compounds not including highly volatile compounds.

Other (OTHER) - substances not specified in other categories in this inventory, or where a clear standard does not exist, but whose presence lowers the water quality or impairs the water quality for its intended use.

Pesticides and Herbicides (P/H) - any of a large variety of these commercial products.

Polychlorinated Biphenyls (PCB) - light, straw-colored liquids with typical chlorinated aromatic odors.

Phenols (PHENOL) - any of the group of phenolic substances.

The contaminants that most often impact groundwater are petroleum products, which are present in 3663 incidents. The next most prevalent contaminants are synthetic volatile organic compounds, occurring in 438 cases. Metals pollution of groundwater occurs in 141 cases. A summary of the number of known cases of groundwater contamination in the State by each group of contaminants is presented in Table 2.

Table 2. Contamination Types Impacting Groundwater

CONTAMINATION TYPES	ABBREVIATION	# OF SITES
Petroleum Products	PETRO	3663
Volatile Organic Compounds	VOC	438
Metals	METALS	141
Nitrates	NO_3	39
Radionuclides	RAD	27
Base, Neutral & Acid Extractables	BNA	22
Other	OTHER	20
Pesticides/Herbicides	P/H	16
Polychlorinated Biphenyls	PCB	7
Phenols	PHENOL	5

The majority (65%) of sites with known groundwater contamination are concentrated around the State's population and industrial centers (Figure 4.) 911 cases exist in the central counties of Lexington, Richland, Sumter, Orangeburg, and Florence. The five coastal counties (Horry, Georgetown, Berkeley, Charleston, and Beaufort) have a total of 925 known cases. 876 cases exist along the growing industrial belts of I-85 (Anderson, Greenville, Spartanburg counties) and I-77 (York County). Table 3 provides a listing of the number of documented cases in each county.

Groundwater contamination at 24 sites has impacted one or more drinking water wells located in the vicinity of the sites, causing these wells to be removed from service (see "remarks" column of the inventory). In addition, at 132 sites contaminated groundwater is discharging to surface waters. The total number of sites increased from 2002.

Table 3. Distribution Of Groundwater Contamination Sites
South Carolina - 2003

County	Number of Sites	County	Number of Sites
Abbeville	27	Hampton	45
Aiken	66	Horry	252
Allendale	30	Jasper	48
Anderson	136	Kershaw	49
Bamberg	41	Lancaster	60
Barnwell	51	Laurens	64
Beaufort	107	Lee	28
Berkeley	123	Lexington	166
Calhoun	14	Marion	70
Charleston	363	Marlboro	40
Cherokee	47	McCormick	15
Chester	50	Newberry	57
Chesterfield	38	Oconee	31
Clarendon	80	Orangeburg	133
Colleton	66	Pickens	36
Darlington	73	Richland	261
Dillon	56	Saluda	18
Dorchester	83	Spartanburg	281
Edgefield	19	Sumter	130
Fairfield	22	Union	18
Florence	221	Williamsburg	63
Georgetown	80	York	158
Greenville	301		
Greenwood	69		

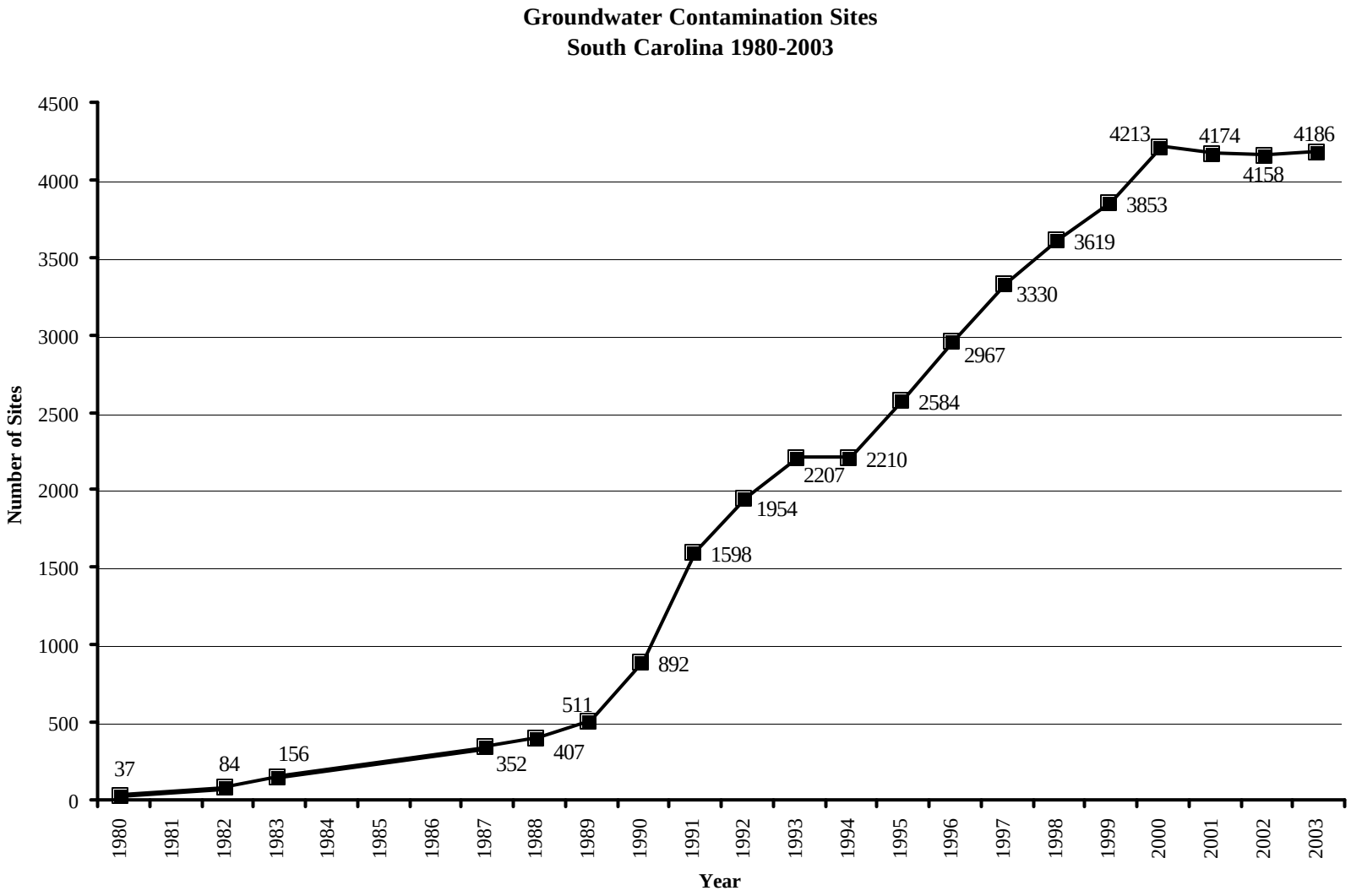

Figure 1. Graph showing the number of known groundwater contamination sites in South Carolina from 1980-2003.

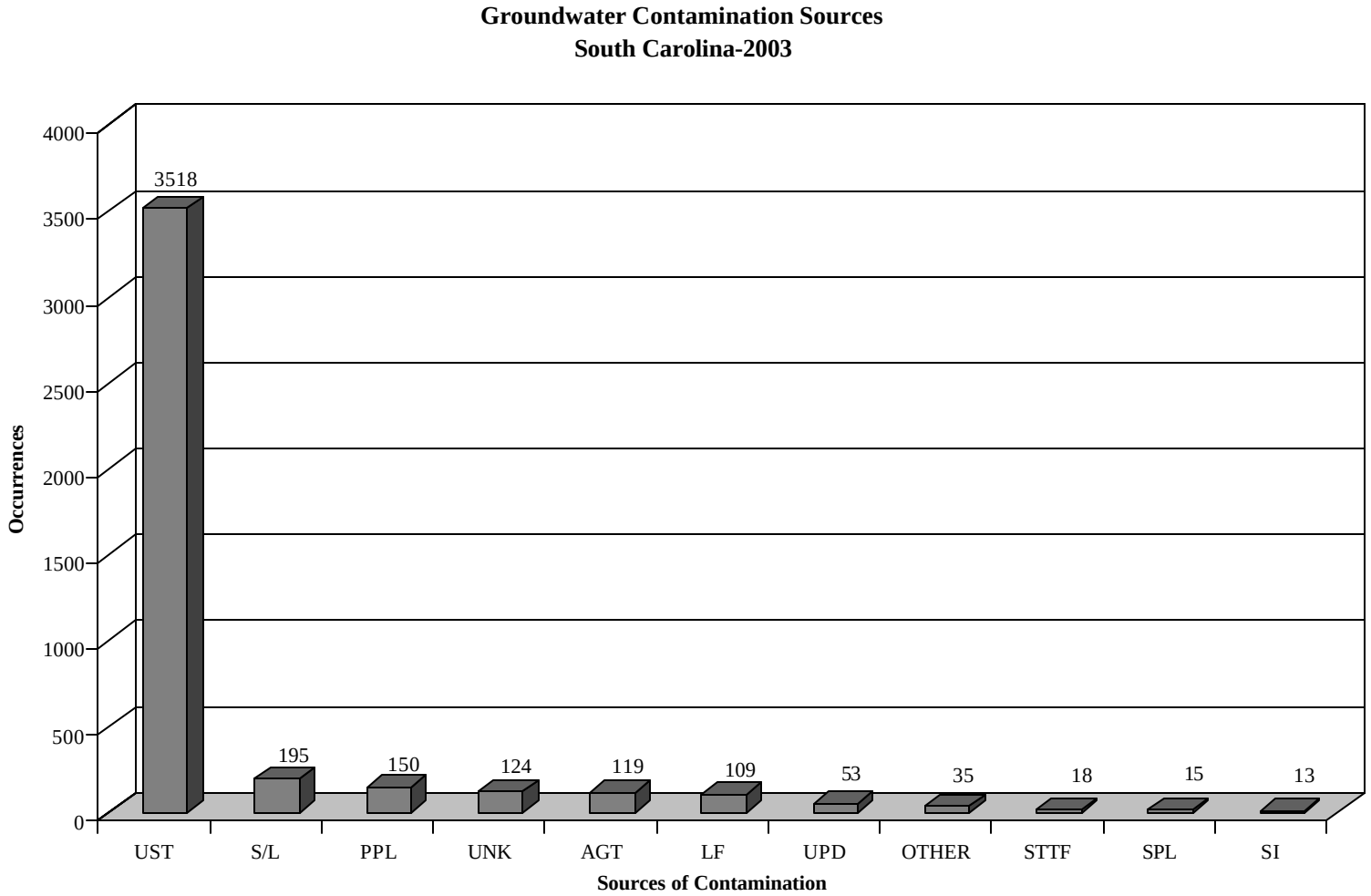

Figure 2. Occurrence of groundwater contamination in South Carolina by source type.

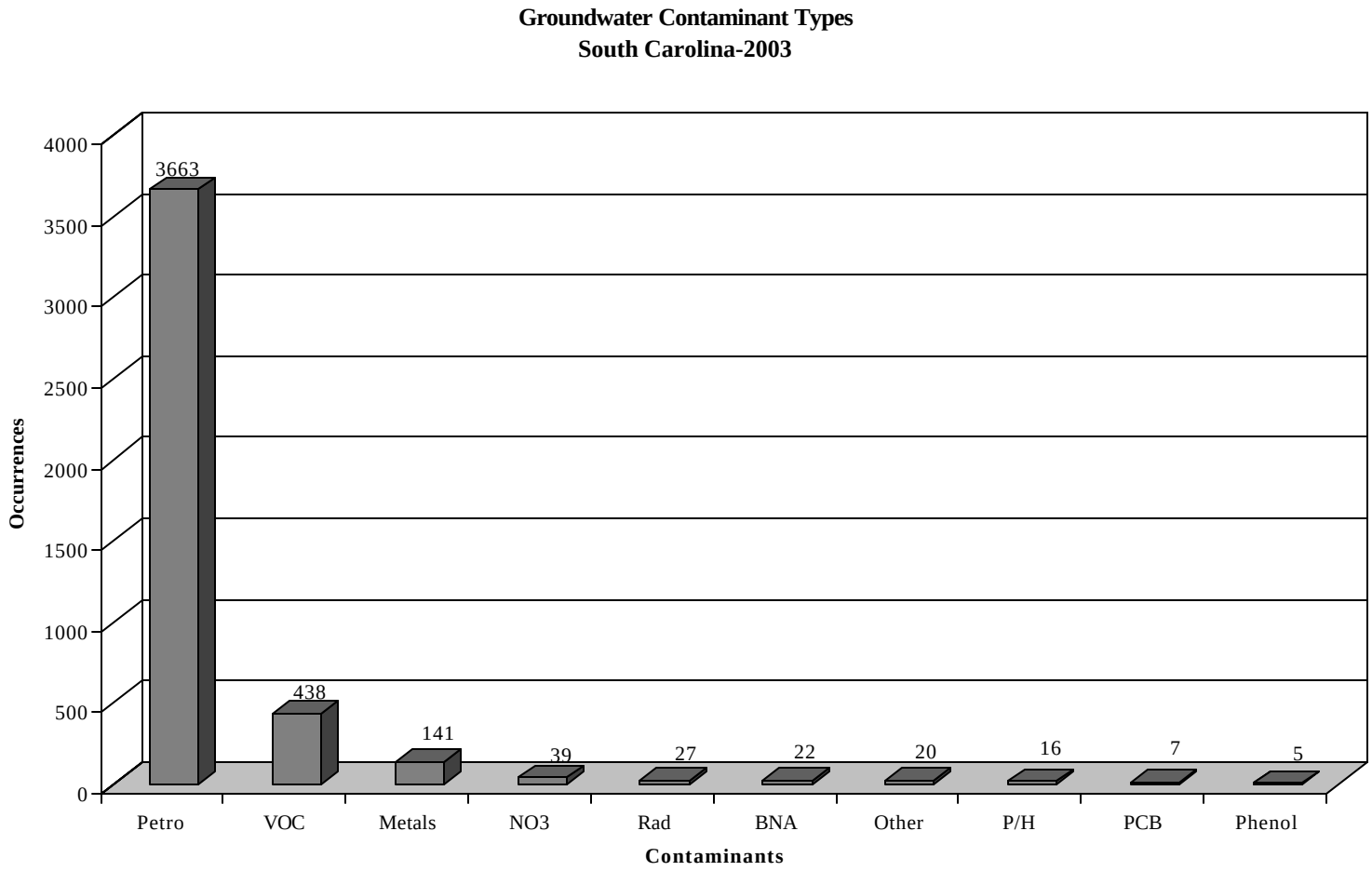

Figure 3. Occurrence of groundwater contamination in South Carolina by contamination type.

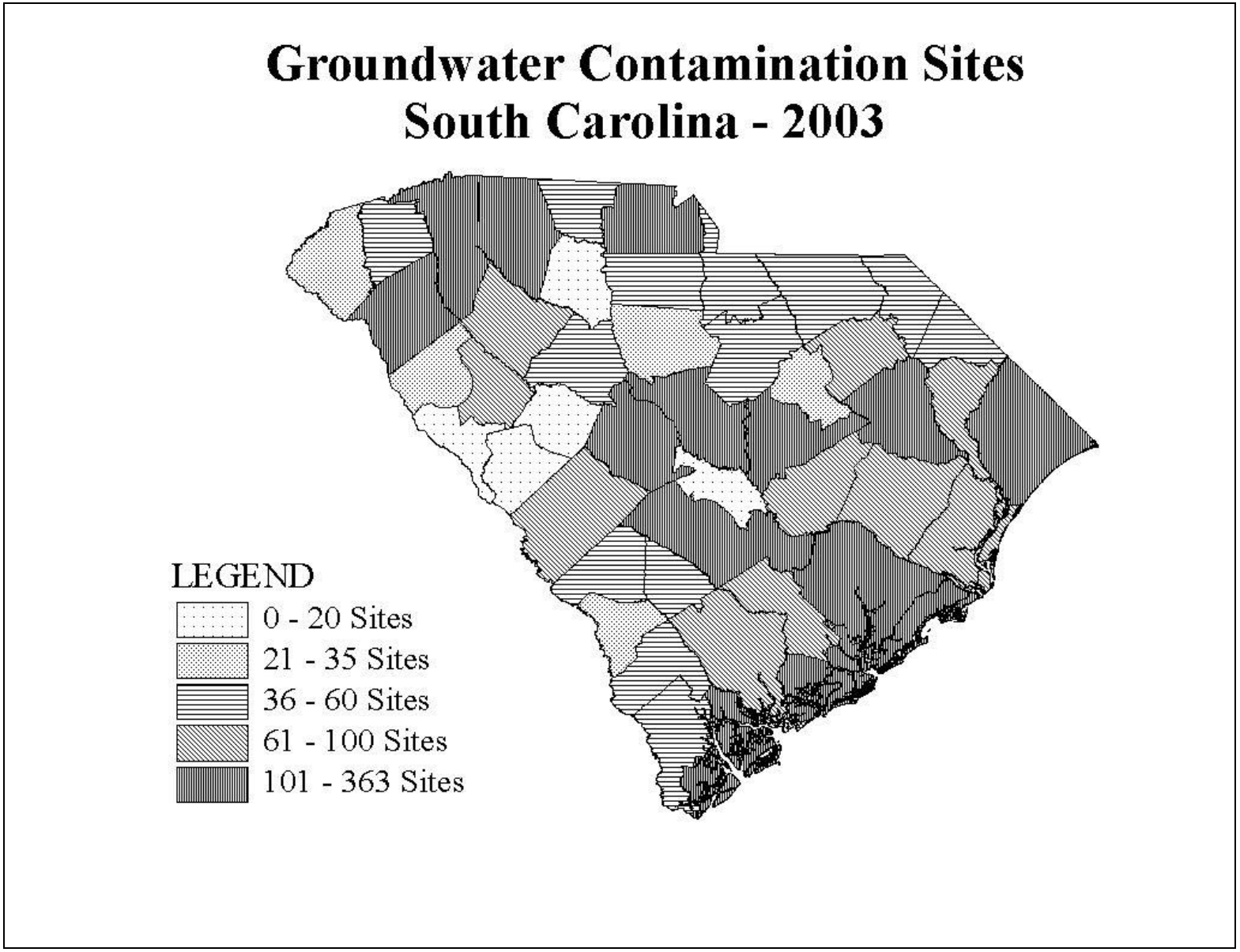

Figure 4. Distribution of known groundwater contamination sites in South Carolina as of August 15, 2003.

APPENDIX A - RBCA PRIORITY CLASSIFICATION SYSTEM

Risk-Based Corrective Action Priority Classification System
for Underground Storage Tanks

UST sites are classified according to the following system. The remarks section of the Inventory includes the Classification for each UST site.

1. Sites are placed in Classification 1 if:
   - an emergency situation exists
   - a fire or explosion hazard exists
   - vapors or free product exists in a structure or utility
   - concentrations of petroleum chemicals of concern have been detected in a potable water supply or surface water supply intake
   - free product exists on surface water
   - petroleum chemicals of concern exist in surface water

2. Sites are placed in Classification 2 if:

Classification 2a:
   - a significant near term (0 to 1 year) threat to human health, safety, or sensitive environmental receptors exists
   - potable supply wells or surface water supply intakes are located < 1 year groundwater travel distance downgradient of the source area

Classification 2b:
   - free product exists in a monitoring well measured at > 1 foot thickness
   - potable supply wells or surface water supply intakes are located < 1000 feet downgradient of the source area (where groundwater velocity data is not available)

3. Sites are placed in Classification 3 if:

Classification 3a:
   - a short term (1 to 2 years) threat to human health, safety, or sensitive environmental receptors exists
   - potable supply wells or surface water supply intakes are located > 1 year and < 2 years groundwater travel distance downgradient of the source area
   - sensitive habitats or surface water exist < 1 year groundwater travel distance downgradient of the source area and the groundwater discharges to the sensitive habitat or surface water

Classification 3b:
   - free product exists in a monitoring well measured at > 0.01 foot thickness
   - concentrations of petroleum chemicals of concern are above the risk-based screening level (RBSL) have been detected in a non-potable water supply well
   - hydrocarbon-containing surface soil (< 3 feet below grade) exists in areas that are not paved
   - sensitive habitats or surface water used for contact recreation exist < 500 feet downgradient of the source area (where groundwater velocity and discharge location data are not available)

- the site is located in a sensitive hydrogeologic setting, determined based on the presence of fractured or carbonate bedrock hydraulically connected to the impacted aquifer
- groundwater is encountered < 15 feet below grade and the site geology is predominantly sand or gravel

4. Sites are placed in Classification 4if:

Classification 4a:

- a long term (> 2 years) threat to human health, safety, or sensitive environmental receptors exists
- potable supply wells or surface water supply intakes are located > 2 years and < 5 years groundwater travel distance downgradient of the source area
- non-potable supply wells area located < 1 year groundwater travel distance downgradient of the source area

Classification 4b:

- free product exists as a sheen in any monitoring wells
- non-potable supply wells are located < 1000 feet downgradient of the source water (where groundwater velocity data is not available
- the groundwater is encountered < 15 feet and the site geology is predominantly silt or clay

5. Sites are placed in Classification 5 if:

- there is no demonstrable threat, but additional data are needed to show that there are no unacceptable risks posed by the site
- assessment data for the site indicate concentrations in some samples are above the RBSL or site specific target level (SSTL), as appropriate, and further assessment is needed
- assessment data for the site indicate concentrations in samples are below the RBSL or SSTL, as appropriate, but the samples are determined to not be representative; therefore, further assessment is needed

APPENDIX B - KNOWN GROUNDWATER CONTAMINATION LIST BY COUNTY